भारतीय मानक
Indian Standard

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(Reaffirmed 2019)

दो एवं तीन पहिये वाले स्वचल वाहनों के व्हील-रिम

भाग 2 शीट धातु व्हील रिम — परीक्षणों एवं अपेक्षाओं की पद्धति

Automotive Vehicles — Wheel Rims for Two and Three Wheeled Vehicles

Part 2 Sheet Metal Wheel Rims — Method of Tests and Requirements

ICS 43.140

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Automotive Tyres, Tubes and Rims Sectional Committee, TED 07

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

This standard is one of the series of Indian Standards pertaining to requirements and method of tests of different wheel rims for two and three wheeled vehicles. The other parts in the series are:

Part 1	Light alloy wheel rims — Method of tests and requirements
Part 3	Spoke wheel rims — Method of tests and requirements

In the formulation of this standard, considerable assistance has been derived from the following standard:

AIS-073 (Part 2)	Automotive vehicles — Wheel rims for two and three wheeled vehicles — Sheet metal wheel rims — Method of test and requirements

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — WHEEL RIMS FOR TWO AND THREE WHEELED VEHICLES

PART 2 SHEET METAL WHEEL RIMS — METHOD OF TESTS AND REQUIREMENTS

1 SCOPE

This standard (Part 2) prescribes the general and performance requirements of sheet metal wheel rims intended for use on two and three wheeled motor vehicles with or without side car.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
10694 (Part 1) : 2009	Automotive vehicles — Rims — General requirements: Part 1 Nomenclature, designation, marking and measurement (*second revision*)
10694 (Part 4) : 1983	General requirements for rims for automotive vehicles: Part 4 scooters and scooter derivatives rims

3 DEFINITIONS AND NOMENCLATURE

Definitions and nomenclature shall be as per IS 10694 (Part 1).

4 REQUIREMENTS RELATING TO WHEEL RIMS

4.1 General Requirements

4.1.1 The wheel rim shall have a smooth contour free from sharp edges on the tyre side.

4.1.2 The valve hole edges on the wheel rims shall be free from burrs.

4.2 Performance Strength Requirements

4.2.1 Only fully processed new wheels rims, which are representative of wheel rims intended for the vehicle, shall be used for the tests. No wheels rim shall be used for more than one test.

4.2.2 *Tests*

Following two tests shall be carried out on wheel rims:

a) Dynamic cornering fatigue test; and
b) Dynamic radial fatigue test.

4.2.3 *Dynamic Cornering Fatigue Test (CFT)*

4.2.3.1 *Equipment*

The test machine shall have a driven rotatable device whereby either the wheel rim rotates under the influence of a stationary bending moment or the wheel rim is stationary and is subjected to a rotating bending moment (*see* Fig. 1).

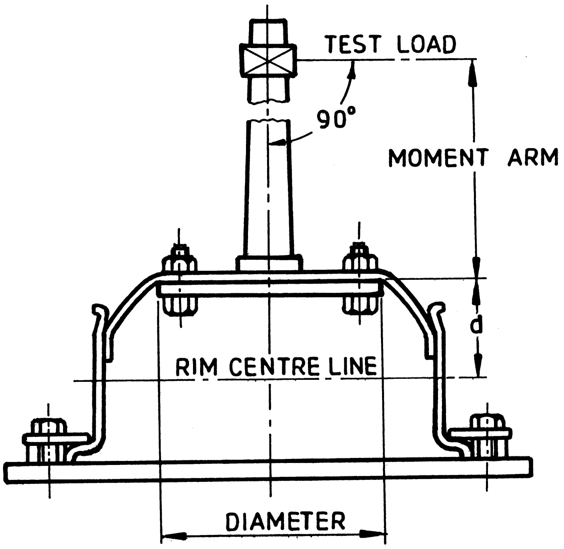

FIG. 1 MODEL EQUIPMENT FOR DYNAMIC CORNERING FATIGUE TEST

4.2.3.2 *Procedure*

a) *Preparation* — The rim flange of the wheel rim shall be clamped securely to the test fixture. The face by which the wheel centre is supported on the testing machine shall have the same fixation characteristics as the face of the hub used on the vehicle. If a tyre and wheel assembly is used as a combination for the test, the tyre pressure shall be higher for clamping purposes. The load arm and adapter assembly shall be attached to the mounting surface of the wheel using non-lubricated studs and nuts (or bolts), in good condition, representative of those used on the vehicle. These wheel nuts (or bolts) shall be tightened at the beginning of the test to the vehicle/wheel manufacturer's specified torque values. Wheel bolts or nuts may be re-torqued once during the test. The bending moment shall be maintained within ± 2.5 percent. In the final clamped position, the wheel shall be concentric to the rotating device within 0.25 mm maximum (TIR) at the point of loading in the unloaded condition.

b) *Bending moment* — To impart a bending moment to the wheel rim, a force may be applied either perpendicular or parallel to the plane of the mounting surface of the wheel at a specified distance (moment arm).

4.2.3.3 *Bending moment determination* — The bending moment M (force × moment arm) in Nm, is determined from the formula:

Vehicle Type	*Bending Moment*
Three wheeled vehicle	$M = (R.\,\mu + d)\,F \times S$
Two wheeled vehicle	$M = S_m \times \mu \times F \times R$

where

R = maximum static loaded radius in meters for which wheel rim is designed;

μ = assumed coefficient of friction developed between tyre and road;

S_m = coefficient equal to 0.7;

d = inset or outset of the wheel rim, in m;

F = maximum design load of wheel rim, in N; and

S = accelerated test factor.

NOTE — For values of μ and S, see Annex A.

4.2.3.4 *Test termination*

a) *For three wheeled vehicles*:

   1) Inability of the wheel rim to sustain bending moment
   2) A fatigue crack penetrating through a section of the wheel rim.
   3) The wheel rim shall withstand a minimum of 18 000 load cycles without failure.

b) *For two wheeled vehicles:*

   After being subjected to 105 cycles according to the dynamic cornering fatigue test specified above, there shall be no evidence of harmful cracks, significant deformation or any abnormal looseness at joints.

4.2.4 *Dynamic Radial Fatigue Test (RFT)*

4.2.4.1 *Equipment*

The test machine shall be equipped with a means of imparting a constant radial load only as the wheel rim rotates. The suggested equipment incorporates a driven rotatable drum set which presents a smooth surface wider than the loaded test tyre section width. The diameter of the drum is 1 700 mm with tolerance of ±1 percent (*see* Fig. 2).

4.2.4.2 *Procedure*

The tyre selected for this wheel rim test shall be representative of the maximum size and type specified by the vehicle/wheel rim manufacturer or at the discretion of the testing agency. The recommended cold

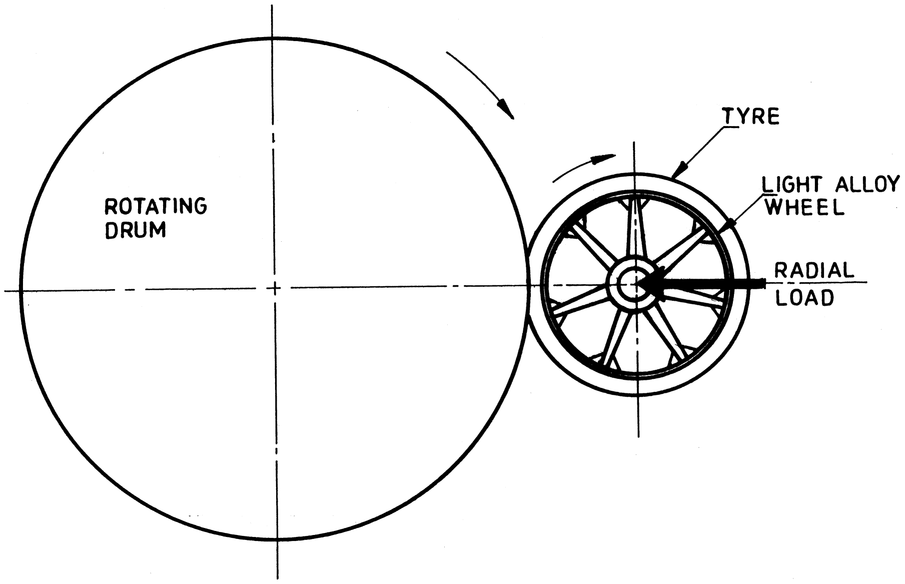

FIG. 2 MODEL EQUIPMENT FOR DYNAMIC RADIAL FATIGUE TEST

inflation pressure of the tyre shall be equal or higher than the maximum recommended inflation pressure.

There may be a slight increase in pressure during the test. This increase is normal and no adjustment is necessary. The loading system shall maintain the specified load within ± 2.5 percent.

4.2.4.3 *Radial load determination*

The radial load F_r, in newton, is determined as follows:

$$F_r = F_v \times K$$

where

F_v = maximum design load of wheel rim, in N; and

K = accelerated test factor.

NOTE — For values of K, *see* Annex A.

4.2.4.4 *Test termination*

a) Inability of wheel rim to sustain load;

b) A fatigue crack penetrating through a section of the wheel rim; and

c) The wheel rim shall withstand a minimum of 400 000 test cycles without failure.

5 IF COMPLIANCE IS TO ESTABLISHED FOR STATUTORY PURPOSES

5.1 Type Approval

5.1.1 The manufacturer shall submit the details as specified in Annex B.

5.1.2 Number of wheel rims to be provided shall be minimum 2 numbers (one with tyre and tube assembly) or at the discretion of test agency.

5.1.3 The type of the wheel rim submitted for approval in pursuance of this standard, if meets the requirements of this standard, approval for that type of wheel rim shall be granted.

5.2 Modification and Extension of Approval of Wheel Rim Type

5.2.1 Every modification of the type of wheel rim shall be notified to testing agency, which has approved the type of wheel rim. The test agency may then either,

(a) consider that the modification made are unlikely to have an appreciable adverse effect and that in any case, the wheel rim still complies with the requirement; or

(b) require a further test report from the testing agency responsible for conducting the test;

5.2.1.1 For considering whether any further verification is required or not, guidelines given in **5.3** (criteria for extension of type approval) may be followed.

5.2.1.2 In case of **5.2.1**(b), check for those parameters which are affected by modifications, only need to be carried out.

5.2.2 In the event of **5.2.1**(a) or in case of **5.2.1**(b) after successful compliance to the requirements, a certificate of compliance shall be validated for the modified version.

5.3 Criteria for Extension of Type Approval

In case of following changes, testing shall be carried out for establishing compliance of the changed parameters to the requirements specified in this standard:

a) Increase in the load carrying capacity;

b) Any change in the design of the wheel rim;

c) Any change in the material of the wheel rim;

d) Any change in the thickness of the wheel rim; and

e) Any change in the inset/outset of the wheel rim.

6 MARKING

6.1 The wheel rim shall be marked with the following:

a) Size designation shall be as per IS 10694 (Part 4);

b) Name or trade-mark of the rim manufacturer; and

c) The letter 'HD' for rims designed for three wheeled goods carriages.

6.2 The marking shall be marked on outside surface so that marking shall be visible after the tyre is mounted and inflated.

6.3 BIS Certification Marking

The product may also be marked with Standard Mark.

6.3.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clauses* 4.2.3.3 *and* 4.2.4.3)

TEST FACTORS

A-1 To permit a uniform application of the test methods specified, the test factors given in the following table should be used when conducting the tests:

Test	*Accelerated Test Factors*
Dynamic cornering fatigue μ = 0.7 (*see* **6.2.3.3**)	*S* = 1.60
Dynamic radial fatigue (*see* **6.2.4.3**)	*K* = 2.25

ANNEX B

(*Clause* 5.1.1)

TECHNICAL INFORMATION TO BE SUBMITTED BY SUPPLIER

1) Name of supplier
2) Address of supplier
3) Telephone No.
4) Fax No.
5) E-mail address
6) Contact person
7) Wheel rim manufacturer name (in case, different for supplier)
8) Address of wheel rim manufacturer (in case, different for supplier)
9) The trade/brand name or mark
10) Wheel rim size designation
11) Type of wheel rim (to be specified)
12) Location rear/front/both
13) Maximum design load of wheel rim
14) Maximum static loaded radius (*R*) for which wheel rim is designed for, in m
15) Engineering drawing of wheel rims giving details of profile, relevant dimensions, tightening torque for wheel bolts, Inset/outset, markings, etc, in triplicate

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Amendments Issued Since Publication

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